



SEQUENCE LISTING

<110> ITO, Kikukatsu

<120> Plant Thermogenic Genes and Proteins

<130> 2001-1838A/LC/00653

<140> 10/009,962

<141> 2002-01-23

<150> PCT/JP00/03806

<151> 2000-06-12

<150> JP11-167439

<151> 1999-06-14

<160> 12

<170> PatentIn Ver. 2.0

<210> 1

<211> 1525

<212> DNA

<213> Symplocarpus foetidus

<220>

<221> CDS

<222> (280)..(1188)

<221> poly A site

<221> (1271)..(1276)

<300>

<301> Ito, K.

<302> Isolation of two distinct cold-inducible cDNAs encoding plant uncoupling proteins from the spadix of skunk cabbage (Symplocarpus foetidus)

<303> Plant Sci.

<304> 149

<305> 2

<306> 167-173

<307> Dec-1999

<308> GenBank AB024733

<309> 2000-02-25

<400> 1

```
gaggattcgc agaagaaagg ccagaaccgc attccttccc gtcttcttct ccttcgcgcc 60
aattgcagtt ttctgcagcg gcgtcatcat caagaccctc cgcctttccg cgccaaacgc 120
cttccacccc cacccaatcg ccttcggttt cccgaaatat tctcttccc tctcccttt 180
tcttctctac ataaacccta accaccccat cctctcctcc cgttccgac caccctgcat 240
tctactggga gcccatattga tcgaggtttc ccggcgagg atg ggc gat cac ggc 294
                                     Met Gly Asp His Gly
                                     1         5
ccg agg acc gag atc tcg ttt gcc ggc agt tcg cga gca gca ttc gcc 342
Pro Arg Thr Glu Ile Ser Phe Ala Gly Ser Ser Arg Ala Ala Phe Ala
               10               15               20
gct tgc ttc gcc gag ctt tgc acg att ccg ttg gac act gct aaa gtt 390
```

Ala	Cys	Phe	Ala	Glu	Leu	Cys	Thr	Ile	Pro	Leu	Asp	Thr	Ala	Lys	Val		
			25					30					35				
agg	ctt	caa	ctc	caa	aag	aaa	gca	gta	aca	ggg	gat	gtg	gtg	gct	ttg	438	
Arg	Leu	Gln	Leu	Gln	Lys	Lys	Ala	Val	Thr	Gly	Asp	Val	Val	Ala	Leu		
			40					45					50				
cca	aaa	tac	agg	gga	atg	ttg	ggc	act	gtt	gcc	act	att	gcc	agg	gag	486	
Pro	Lys	Tyr	Arg	Gly	Met	Leu	Gly	Thr	Val	Ala	Thr	Ile	Ala	Arg	Glu		
			55					60					65				
gaa	ggg	ttg	tcg	gca	ctc	tgg	aaa	gga	att	gta	ccc	ggg	ttg	cat	cgt	534	
Glu	Gly	Leu	Ser	Ala	Leu	Trp	Lys	Gly	Ile	Val	Pro	Gly	Leu	His	Arg		
			70			75				80					85		
caa	tgc	ctc	ttt	gga	ggg	cta	cga	att	ggg	ttg	tat	gaa	cca	gtt	aag	582	
Gln	Cys	Leu	Phe	Gly	Gly	Leu	Arg	Ile	Gly	Leu	Tyr	Glu	Pro	Val	Lys		
				90					95					100			
tcc	ttt	tat	gtt	gga	gat	aac	ttt	gtt	gga	gat	att	cct	tta	tcc	aag	630	
Ser	Phe	Tyr	Val	Gly	Asp	Asn	Phe	Val	Gly	Asp	Ile	Pro	Leu	Ser	Lys		
			105					110					115				
aaa	ata	ctt	gct	ggg	ctt	aca	aca	ggg	gca	tta	gca	att	ata	gtg	gca	678	
Lys	Ile	Leu	Ala	Gly	Leu	Thr	Thr	Gly	Ala	Leu	Ala	Ile	Ile	Val	Ala		
			120					125					130				
aat	ccc	act	gac	ctt	gtt	aaa	gtt	cga	ctt	caa	tct	gaa	ggg	aaa	ctc	726	
Asn	Pro	Thr	Asp	Leu	Val	Lys	Val	Arg	Leu	Gln	Ser	Glu	Gly	Lys	Leu		
			135			140					145						
ccc	cct	ggg	gta	ccg	aga	cgt	tat	tca	ggg	gcg	cta	aat	gct	tat	tca	774	
Pro	Pro	Gly	Val	Pro	Arg	Arg	Tyr	Ser	Gly	Ala	Leu	Asn	Ala	Tyr	Ser		
			150			155				160				165			
acc	ata	gtc	aaa	aag	gaa	gga	ctt	ggg	gct	ctg	tgg	act	ggg	ctt	ggg	822	
Thr	Ile	Val	Lys	Lys	Glu	Gly	Leu	Gly	Ala	Leu	Trp	Thr	Gly	Leu	Gly		
				170				175						180			
cct	aat	att	gcc	cgc	aat	gct	att	ata	aat	gct	gct	gaa	ttg	gcc	agt	870	
Pro	Asn	Ile	Ala	Arg	Asn	Ala	Ile	Ile	Asn	Ala	Ala	Glu	Leu	Ala	Ser		
			185					190						195			
tat	gat	caa	gtg	aaa	cag	aca	atc	tta	aaa	tta	cca	gga	ttc	tca	gat	918	
Tyr	Asp	Gln	Val	Lys	Gln	Thr	Ile	Leu	Lys	Leu	Pro	Gly	Phe	Ser	Asp		
			200				205					210					
aat	att	ttt	act	cat	att	tta	gcc	ggg	ctg	ggg	gca	ggg	ttt	ttt	gcc	966	
Asn	Ile	Phe	Thr	His	Ile	Leu	Ala	Gly	Leu	Gly	Ala	Gly	Phe	Phe	Ala		
			215			220					225						
gtc	tgt	atc	ggg	tct	cct	gtt	gat	gtg	atg	aag	tct	aga	atg	atg	gga	1014	
Val	Cys	Ile	Gly	Ser	Pro	Val	Asp	Val	Met	Lys	Ser	Arg	Met	Met	Gly		
			230			235				240				245			
gat	tca	gcc	tac	aaa	agc	aca	ttt	gat	tgt	ttc	atc	aag	aca	ttg	aaa	1062	
Asp	Ser	Ala	Tyr	Lys	Ser	Thr	Phe	Asp	Cys	Phe	Ile	Lys	Thr	Leu	Lys		
				250					255					260			
aat	gat	ggg	ctt	ctt	gct	ttt	tac	aag	ggg	ttt	atc	cca	aac	ttt	ggg	1110	
Asn	Asp	Gly	Leu	Leu	Ala	Phe	Tyr	Lys	Gly	Phe	Ile	Pro	Asn	Phe	Gly		
			265					270					275				
cgg	tta	gga	tcg	tgg	aat	gtg	atc	atg	ttt	ttg	acc	ttg	gag	cag	gtc	1158	
Arg	Leu	Gly	Ser	Trp	Asn	Val	Ile	Met	Phe	Leu	Thr	Leu	Glu	Gln	Val		
			280			285						290					
aag	aag	ttt	ttc	atc	aaa	gag	gtg	cca	aat	taatacattg	aactcggata					1208	
Lys	Lys	Phe	Phe	Ile	Lys	Glu	Val	Pro	Asn								
			295			300											
ggagtagaaa	gaaaggggtt	ttgtggaatt	ttctctaccg	gtgtggatcc	tggcgagaga											1268	
caaataaatc	ttcctgactg	ctcagatgtg	tacctttttt	atgaatggtt	cttttcttat											1328	
agaggacaga	gaaaagaaaa	aaaaaatcat	tgctcatttac	tctttttccc	catttctgct											1388	
gctaattcttg	gtaggagaag	aaaagtctta	cattgagtga	taacgttggtt	ctctgcatcc											1448	

attatatttttc agagatacta tttgacacat gaaaagtaat gcacatcagg ttttttttaa 1508  
 aaaaaaaaaa aaaaaaaa 1525

<210> 2  
 <211> 303  
 <212> PRT  
 <213> *Symplocarpus foetidus*

<400> 2  
 Met Gly Asp His Gly Pro Arg Thr Glu Ile Ser Phe Ala Gly Ser Ser  
 1 5 10 15  
 Arg Ala Ala Phe Ala Ala Cys Phe Ala Glu Leu Cys Thr Ile Pro Leu  
 20 25 30  
 Asp Thr Ala Lys Val Arg Leu Gln Leu Gln Lys Lys Ala Val Thr Gly  
 35 40 45  
 Asp Val Val Ala Leu Pro Lys Tyr Arg Gly Met Leu Gly Thr Val Ala  
 50 55 60  
 Thr Ile Ala Arg Glu Glu Gly Leu Ser Ala Leu Trp Lys Gly Ile Val  
 65 70 75 80  
 Pro Gly Leu His Arg Gln Cys Leu Phe Gly Gly Leu Arg Ile Gly Leu  
 85 90 95  
 Tyr Glu Pro Val Lys Ser Phe Tyr Val Gly Asp Asn Phe Val Gly Asp  
 100 105 110  
 Ile Pro Leu Ser Lys Lys Ile Leu Ala Gly Leu Thr Thr Gly Ala Leu  
 115 120 125  
 Ala Ile Ile Val Ala Asn Pro Thr Asp Leu Val Lys Val Arg Leu Gln  
 130 135 140  
 Ser Glu Gly Lys Leu Pro Pro Gly Val Pro Arg Arg Tyr Ser Gly Ala  
 145 150 155 160  
 Leu Asn Ala Tyr Ser Thr Ile Val Lys Lys Glu Gly Leu Gly Ala Leu  
 165 170 175  
 Trp Thr Gly Leu Gly Pro Asn Ile Ala Arg Asn Ala Ile Ile Asn Ala  
 180 185 190  
 Ala Glu Leu Ala Ser Tyr Asp Gln Val Lys Gln Thr Ile Leu Lys Leu  
 195 200 205  
 Pro Gly Phe Ser Asp Asn Ile Phe Thr His Ile Leu Ala Gly Leu Gly  
 210 215 220  
 Ala Gly Phe Phe Ala Val Cys Ile Gly Ser Pro Val Asp Val Met Lys  
 225 230 235 240  
 Ser Arg Met Met Gly Asp Ser Ala Tyr Lys Ser Thr Phe Asp Cys Phe  
 245 250 255  
 Ile Lys Thr Leu Lys Asn Asp Gly Leu Leu Ala Phe Tyr Lys Gly Phe  
 260 265 270  
 Ile Pro Asn Phe Gly Arg Leu Gly Ser Trp Asn Val Ile Met Phe Leu  
 275 280 285  
 Thr Leu Glu Gln Val Lys Lys Phe Phe Ile Lys Glu Val Pro Asn  
 290 295 300

<210> 3  
 <211> 2991  
 <212> DNA  
 <213> *Symplocarpus foetidus*

<220>  
 <221> CDS  
 <222> (286)..(1089)  
 <221> poly A site

<222> (1171)..(1176)

<221> poly A site

<222> (1243)..(1248)

<300>

<301> Ito, K.

<302> Isolation of two distinct cold-inducible cDNAs encoding plant uncoupling proteins from the

spadix of skunk cabbage (*Symplocarpus foetidus*)

<303> Plant Sci.

<304> 149

<305> 2

<306> 167-173

<307> Dec-1999

<308> GenBank AB024734

<309> 2000-02-25

<400> 3

tggtggtgac gagtgacgag gattcgcaga agaaaggcca gaacccgatt ctttcccgctc 60  
ttctttctcct tccgcccatt tgcagttttt cgcagcgggt catcatcaag accctccgcc 120  
tttccgcgcc aaacgccttc cacccaatcc ctccgtttcc cgaaatattc cccttccctc 180  
ccttttcttc tctacataaa ccctaaccac ccccatcctc tcttcccgct tccgaccacc 240  
ctgcattcta ctgggatccc atttgatcga cgtttcccggt cgagg atg ggc gat cac 297

Met Gly Asp His

1

ggc ccg agg acc gag atc tcg ttt gcc ggc agt tcg cga gca gca ttc 345  
Gly Pro Arg Thr Glu Ile Ser Phe Ala Gly Ser Ser Arg Ala Ala Phe  
5 10 15 20  
gcc gct tgc ttc gcc gag ctc tgt acg att ccg ttg gac act gct aaa 393  
Ala Ala Cys Phe Ala Glu Leu Cys Thr Ile Pro Leu Asp Thr Ala Lys  
25 30 35  
gtt agg ctt cag ctc caa aag aaa gca gta aca ggt gat gtg gtg gct 441  
Val Arg Leu Gln Leu Gln Lys Lys Ala Val Thr Gly Asp Val Val Ala  
40 45 50  
ttg cca aaa tac agg gga atg ttg ggc act gtt gcc act att gcc agg 489  
Leu Pro Lys Tyr Arg Gly Met Leu Gly Thr Val Ala Thr Ile Ala Arg  
55 60 65  
gag gaa ggt ttg tcg gca ctc tgg aaa gga att gta ccc ggt ttg cat 537  
Glu Glu Gly Leu Ser Ala Leu Trp Lys Gly Ile Val Pro Gly Leu His  
70 75 80  
cgt caa tgc ctc ttt gga ggg cta cga att ggg ttg tat gaa cca gtt 585  
Arg Gln Cys Leu Phe Gly Gly Leu Arg Ile Gly Leu Tyr Glu Pro Val  
85 90 95 100  
aag tcc ttt tat gtt gga gat aac ttt gtt gga gat att cct tta tcc 633  
Lys Ser Phe Tyr Val Gly Asp Asn Phe Val Gly Asp Ile Pro Leu Ser  
105 110 115  
aag aaa ata ctt gct ggg ctt aca aca ggt gca tta gca att ata gtg 681  
Lys Lys Ile Leu Ala Gly Leu Thr Thr Gly Ala Leu Ala Ile Ile Val  
120 125 130  
gca aat ccg act gac ctt gtt aaa gtt cga ctt caa tct gaa ggt aaa 729  
Ala Asn Pro Thr Asp Leu Val Lys Val Arg Leu Gln Ser Glu Gly Lys  
135 140 145  
ctc ccc cct ggg gta cca aga cgt tat tca ggg gcg cta aat gct tat 777  
Leu Pro Pro Gly Val Pro Arg Arg Tyr Ser Gly Ala Leu Asn Ala Tyr  
150 155 160  
tca acc ata gtc aaa aag gaa gga ctt ggt gct ctg tgg act ggg ctt 825  
Ser Thr Ile Val Lys Lys Glu Gly Leu Gly Ala Leu Trp Thr Gly Leu

165	170	175	180	
ggt cct aat att gcc cgc aat gct att ata aat gct gct gaa ttg gcc				873
Gly Pro Asn Ile Ala Arg Asn Ala Ile Ile Asn Ala Ala Glu Leu Ala				
	185	190	195	
agt tat gat caa gtg aaa cag atg aag tct aga atg atg gga gat tca				921
Ser Tyr Asp Gln Val Lys Gln Met Lys Ser Arg Met Met Gly Asp Ser				
	200	205	210	
gcc tac aaa agc aca ttt gat tgt ttc atc aag acg ttg aaa aat gat				969
Ala Tyr Lys Ser Thr Phe Asp Cys Phe Ile Lys Thr Leu Lys Asn Asp				
	215	220	225	
ggg cct ctt gct ttt tac aag ggg ttt atc cca aac ttt ggt cgg tta				1017
Gly Pro Leu Ala Phe Tyr Lys Gly Phe Ile Pro Asn Phe Gly Arg Leu				
	230	235	240	
gga tcg tgg aat gtg atc atg ttt ttg acc ttg gag cag gtc aag aag				1065
Gly Ser Trp Asn Val Ile Met Phe Leu Thr Leu Glu Gln Val Lys Lys				
	245	250	255	260
ttc ttc atc aaa gag gtg cca aat taatacattg aagtcggata ggagtagaaa				1119
Phe Phe Ile Lys Glu Val Pro Asn				
	265			
aaaaagggttt ttgtggaatt ttctctaccg gtgtggatcc tggcgagaga gaataaatct				1179
tcctgactgc tcagatgttg tacctttttt atgaatgggt cttttcttat agaggacaga				1239
gaaaataaaa gaaaaattca ttgtcatgta ctctttttcc ccatttctgc tgagtagcag				1299
ctataccaag cagactttgt tgcttggtcg ctgctaactc tgtagctgaa gaaaagtctt				1359
acattgagtg ataacgttgt tctctgcac cattattttt cagagttact atttgacaca				1419
tgaaaagtgt tttttttttt tttttttttt aacaggcagc aaatagagga atcgatctca				1479
cgactatcct ctttattcat taacaggcat acaaacttag ggagagcatg cagggtatat				1539
atcaaaaatat acccttttat tagacatttt gogtacacag ttggtcctca aacgactgta				1599
tctagcagcc aatttttaga ccacattaag acagagagaa acaagcagaa gaacagggtta				1659
ccatacatat ataggtaata attaatgata tgaacatagc ataggttcat gatctacttc				1719
ttcttcacgt acacatgatg caccagctga atgggaatct tggtcacat atggcatgaa				1779
agtagctcat gtgcagacgt tatatagtgt tcttcttacc attcagcagc agcaccagag				1839
gcatcaaaaca ctgggggtctt gacaggggat gaggggtaca ttgcgatccc acacatgccg				1899
tagggagtca cattgcgttt gatttttatg tatccagcct gtccccacct agtgccccat				1959
gagttcctta caagccaata atccttccca tcttccgaac catatcctat tatcaccaca				2019
gcatggtcga tacgttgacc acatggtcca gcaaatagc cagaggtgta gtgttggaat				2079
ccagcgcccg aagcctcaag agcaacactg acaggttgct ttgcgactgc atactgtagg				2139
ctaaccctcg tgtacggaga aacattttca tacgcataca tgcaggtgac tttaataaga				2199
tttgcctcgc aagtccctcg acgtccctgt tacgggtaat ttttgaaaaa aggagaagg				2259
cggaagaag cgcgcgcttc tgctcgcgac ggggttaatt ttcatatggc cacttcgagc				2319
atggcttcgg cagcctccag cttegttctc actccggcct cccctccacc accacgccgg				2379
ttcccccgtc cgccttcttt cccagggctg caggaggctc gtggtggtgc gggcggagga				2439
agccgcgacg acccccgccc cggcgccggg cggaggagag cgcgcgcggg cccccaagcc				2499
gccaccgatc gggcccaaga ggggggtcaa ggttgatata tagttcttaa tttctttccc				2559
gtgtggcttc tggagttaga tttgtttcct ctctctttt tttgttttgt tttttcaatt				2619
taaattttat tctcatctgt ggacgacctt ccatcggggt tttcgtccct ctgcaggtg				2679
aagatctccg gaaggaatcc tactggttca acggtgtcgg atcgggtggtg gctgttgatc				2739
aggatccggc gactcgatac ccggtcgtgg ttccggttcac caaggtcaac tatgcgaacg				2799
tctcgacca caactacgca ctggacgaga tctggagggt gaaatgaggg tcggcgggcg				2859
tggtcggctg ggcattgtc gatgatgtat ttctgcagtt ggtagtgtaa aataccatgt				2919
cattcgtgta aaactctttc gttcgcaaaa tctcagttg aaattttaat tcccagccag				2979
taaaaaaaaa aa				2991

<210> 4  
 <211> 268  
 <212> PRT  
 <213> Symplocarpus foetidus

<400> 4  
Met Gly Asp His Gly Pro Arg Thr Glu Ile Ser Phe Ala Gly Ser Ser  
1 5 10 15  
Arg Ala Ala Phe Ala Ala Cys Phe Ala Glu Leu Cys Thr Ile Pro Leu  
20 25 30  
Asp Thr Ala Lys Val Arg Leu Gln Leu Gln Lys Lys Ala Val Thr Gly  
35 40 45  
Asp Val Val Ala Leu Pro Lys Tyr Arg Gly Met Leu Gly Thr Val Ala  
50 55 60  
Thr Ile Ala Arg Glu Glu Gly Leu Ser Ala Leu Trp Lys Gly Ile Val  
65 70 75 80  
Pro Gly Leu His Arg Gln Cys Leu Phe Gly Gly Leu Arg Ile Gly Leu  
85 90 95  
Tyr Glu Pro Val Lys Ser Phe Tyr Val Gly Asp Asn Phe Val Gly Asp  
100 105 110  
Ile Pro Leu Ser Lys Lys Ile Leu Ala Gly Leu Thr Thr Gly Ala Leu  
115 120 125  
Ala Ile Ile Val Ala Asn Pro Thr Asp Leu Val Lys Val Arg Leu Gln  
130 135 140  
Ser Glu Gly Lys Leu Pro Pro Gly Val Pro Arg Arg Tyr Ser Gly Ala  
145 150 155 160  
Leu Asn Ala Tyr Ser Thr Ile Val Lys Lys Glu Gly Leu Gly Ala Leu  
165 170 175  
Trp Thr Gly Leu Gly Pro Asn Ile Ala Arg Asn Ala Ile Ile Asn Ala  
180 185 190  
Ala Glu Leu Ala Ser Tyr Asp Gln Val Lys Gln Met Lys Ser Arg Met  
195 200 205  
Met Gly Asp Ser Ala Tyr Lys Ser Thr Phe Asp Cys Phe Ile Lys Thr  
210 215 220  
Leu Lys Asn Asp Gly Pro Leu Ala Phe Tyr Lys Gly Phe Ile Pro Asn  
225 230 235 240  
Phe Gly Arg Leu Gly Ser Trp Asn Val Ile Met Phe Leu Thr Leu Glu  
245 250 255  
Gln Val Lys Lys Phe Phe Ile Lys Glu Val Pro Asn  
260 265

<210> 5  
<211> 306  
<212> PRT  
<213> Solanum Tuberosum

<400> 5  
Met Gly Gly Gly Asp His Gly Gly Lys Ser Asp Ile Ser Phe Ala Gly  
1 5 10 15  
Ile Phe Ala Ser Ser Ala Phe Ala Ala Cys Phe Ala Glu Ala Cys Thr  
20 25 30  
Leu Pro Leu Asp Thr Ala Lys Val Arg Leu Gln Leu Gln Lys Lys Ala  
35 40 45  
Val Glu Gly Asp Gly Leu Ala Leu Pro Lys Tyr Arg Gly Leu Leu Gly  
50 55 60  
Thr Val Gly Thr Ile Ala Lys Glu Glu Gly Ile Ala Ser Leu Trp Lys  
65 70 75 80

Gly Ile Val Pro Gly Leu His Arg Gln Cys Ile Tyr Gly Gly Leu Arg  
                     85                    90                    95  
 Ile Gly Met Tyr Glu Pro Val Lys Asn Leu Tyr Val Gly Lys Asp His  
                     100                    105                    110  
 Val Gly Asp Val Pro Leu Ser Lys Lys Ile Leu Ala Ala Leu Thr Thr  
                     115                    120                    125  
 Gly Ala Leu Gly Ile Thr Ile Ala Asn Pro Thr Asp Leu Val Lys Val  
                     130                    135                    140  
 Arg Leu Gln Ala Glu Gly Lys Leu Pro Ala Gly Val Pro Arg Arg Tyr  
                     145                    150                    155                    160  
 Ser Gly Ala Leu Asn Ala Tyr Ser Thr Ile Val Lys Gln Glu Gly Val  
                     165                    170                    175  
 Arg Ala Leu Trp Thr Gly Leu Gly Pro Asn Ile Gly Arg Asn Ala Ile  
                     180                    185                    190  
 Ile Asn Ala Ala Glu Leu Ala Ser Tyr Asp Gln Val Lys Glu Ala Val  
                     195                    200                    205  
 Leu Arg Ile Pro Gly Phe Thr Asp Asn Val Val Thr His Leu Ile Ala  
                     210                    215                    220  
 Gly Leu Gly Ala Gly Phe Phe Ala Val Cys Ile Gly Ser Pro Val Asp  
                     225                    230                    235                    240  
 Val Val Lys Ser Arg Met Met Gly Asp Ser Ala Tyr Lys Asn Thr Leu  
                     245                    250                    255  
 Asp Cys Phe Val Lys Thr Leu Lys Asn Asp Gly Pro Leu Ala Phe Tyr  
                     260                    265                    270  
 Lys Gly Phe Ile Pro Asn Phe Gly Arg Leu Gly Ser Trp Asn Val Ile  
                     275                    280                    285  
 Met Phe Leu Thr Leu Glu Gln Ala Lys Lys Phe Val Lys Ser Leu Glu  
                     290                    295                    300  
 Ser Pro  
 305

<210> 6  
 <211> 316  
 <212> PRT  
 <213> Arabidopsis thaliana

<400> 6  
 Met Val Ala Ala Gly Lys Ser Asp Leu Ser Leu Pro Lys Thr Phe Ala  
   1                    5                    10                    15  
 Cys Ser Ala Phe Ala Ala Cys Val Gly Glu Val Cys Thr Ile Pro Leu  
                     20                    25                    30

Asp Thr Ala Lys Val Arg Leu Gln Leu Gln Lys Ser Ala Phe Thr Leu  
 35 40 45  
 Ala Gly Asp Val Thr Leu Pro Lys Tyr Arg Gly Leu Leu Gly Thr Val  
 50 55 60  
 Gly Thr Ile Ala Arg Glu Glu Gly Leu Arg Ser Leu Trp Lys Gly Val  
 65 70 75 80  
 Val Pro Gly Leu His Arg Gln Cys Leu Phe Gly Gly Leu Arg Ile Gly  
 85 90 95  
 Met Tyr Glu Pro Val Lys Asn Leu Tyr Val Phe Thr Gly Lys Asp Phe  
 100 105 110  
 Val Gly Asp Val Pro Leu Ser Lys Lys Ile Leu Ala Gly Leu Thr Thr  
 115 120 125  
 Gly Ala Leu Gly Ile Met Val Ala Asn Pro Thr Asp Leu Val Lys Val  
 130 135 140  
 Arg Leu Gln Ala Glu Gly Lys Leu Ala Ala Gly Ala Pro Arg Arg Tyr  
 145 150 155 160  
 Ser Gly Ala Leu Asn Ala Tyr Phe Thr Ser Thr Ile Val Arg Gln Glu  
 165 170 175  
 Gly Val Arg Ala Leu Trp Thr Val Leu Gly Pro Asn Val Ala Arg Asn  
 180 185 190  
 Ala Ile Ile Asn Ala Ala Glu Leu Ala Ser Tyr Asp Gln Val Lys Glu  
 195 200 205  
 Thr Ile Leu Lys Ile Pro Gly Phe Thr Asp Asn Val Val Thr His Ile  
 210 215 220  
 Leu Ser Gly Leu Phe Thr Gly Ala Gly Phe Phe Ala Val Cys Ile Gly  
 225 230 235 240  
 Ser Pro Val Asp Val Val Lys Ser Arg Met Met Gly Asp Ser Gly Ala  
 245 250 255  
 Tyr Lys Gly Thr Ile Asp Cys Phe Val Lys Thr Leu Lys Ser Asp Gly  
 260 265 270  
 Pro Met Ala Phe Tyr Lys Gly Phe Ile Pro Asn Phe Gly Arg Leu Gly  
 275 280 285  
 Ser Phe Thr Trp Asn Val Ile Met Phe Leu Thr Leu Glu Gln Ala Lys  
 290 295 300  
 Lys Tyr Val Arg Glu Leu Asp Ala Ser Lys Arg Asn  
 305 310 315

<210> 7  
 <211> 307



<212> PRT

<213> Homo sapiens

<400> 7

Met	Gly	Gly	Leu	Thr	Ala	Ser	Asp	Val	His	Pro	Thr	Leu	Gly	Val	Gln	
1				5					10					15		
Leu	Phe	Ser	Ala	Pro	Ile	Ala	Ala	Cys	Leu	Ala	Asp	Val	Ile	Thr	Phe	
			20					25					30			
Pro	Leu	Asp	Thr	Ala	Lys	Val	Arg	Leu	Gln	Val	Gln	Gly	Glu	Cys	Pro	
		35					40					45				
Thr	Ser	Ser	Val	Ile	Arg	Tyr	Lys	Gly	Val	Leu	Gly	Thr	Ile	Thr	Ala	
	50					55					60					
Val	Val	Lys	Thr	Glu	Gly	Arg	Met	Lys	Leu	Tyr	Ser	Gly	Leu	Pro	Ala	
	65				70					75					80	
Gly	Leu	Gln	Arg	Gln	Ile	Ser	Ser	Ala	Ser	Leu	Arg	Ile	Gly	Leu	Tyr	
				85					90						95	
Asp	Thr	Val	Gln	Glu	Phe	Leu	Thr	Ala	Gly	Lys	Glu	Thr	Ala	Pro	Ser	
			100					105					110			
Leu	Gly	Ser	Lys	Ile	Leu	Ala	Gly	Leu	Thr	Thr	Gly	Gly	Val	Ala	Val	
		115					120					125				
Phe	Ile	Gly	Gln	Pro	Thr	Glu	Val	Val	Lys	Val	Arg	Leu	Gln	Ala	Gln	
	130					135					140					
Ser	His	Leu	His	Gly	Ile	Lys	Pro	Arg	Tyr	Thr	Gly	Thr	Tyr	Asn	Ala	
	145				150					155					160	
Tyr	Arg	Ile	Ile	Ala	Thr	Thr	Glu	Gly	Leu	Thr	Gly	Leu	Trp	Lys	Gly	
			165						170					175		
Thr	Thr	Pro	Asn	Leu	Met	Arg	Ser	Val	Ile	Ile	Asn	Cys	Thr	Glu	Leu	
			180					185					190			
Val	Thr	Tyr	Asp	Leu	Met	Lys	Glu	Ala	Phe	Val	Lys	Asn	Asn	Ile	Leu	
		195					200					205				
Ala	Asp	Asp	Val	Pro	Cys	His	Leu	Val	Ser	Ala	Leu	Ile	Ala	Gly	Phe	
	210					215					220					
Cys	Ala	Thr	Ala	Met	Ser	Ser	Pro	Val	Asp	Val	Val	Lys	Thr	Arg	His	
	225				230					235					240	
Ile	Asn	Ser	Pro	Pro	Gly	Gln	Tyr	Lys	Ser	Val	Pro	Asn	Cys	Ala	Met	
				245					250					255		
Lys	Val	Phe	Thr	Asn	Glu	Gly	Pro	Thr	Ala	Phe	Phe	Lys	Gly	Leu	Val	
			260					265					270			
Pro	Ser	Phe	Leu	Arg	Leu	Gly	Ser	Trp	Asn	Val	Ile	Met	Phe	Val	Cys	
		275					280					285				

Phe Glu Gln Leu Lys Arg Glu Leu Ser Lys Ser Arg Gln Thr Met Asp  
 290 295 300

Cys Ala Thr  
 305

<210> 8  
 <211> 309  
 <212> PRT  
 <213> Homo sapiens

<400> 8  
 Met Val Gly Phe Lys Ala Thr Asp Val Pro Pro Thr Ala Thr Val Lys  
 1 5 10 15

Phe Leu Gly Ala Gly Thr Ala Ala Cys Ile Ala Asp Leu Ile Thr Phe  
 20 25 30

Pro Leu Asp Thr Ala Lys Val Arg Leu Gln Ile Gln Gly Glu Ser Gln  
 35 40 45

Gly Pro Val Arg Ala Thr Ala Ser Ala Gln Tyr Arg Gly Val Met Gly  
 50 55 60

Thr Ile Leu Thr Met Val Arg Thr Glu Gly Pro Arg Ser Leu Tyr Asn  
 65 70 75 80

Gly Leu Val Ala Gly Leu Gln Arg Gln Met Ser Phe Ala Ser Val Arg  
 85 90 95

Ile Gly Leu Tyr Asp Ser Val Lys Gln Phe Tyr Thr Lys Gly Ser Glu  
 100 105 110

His Ala Ser Ile Gly Ser Arg Leu Leu Ala Gly Ser Thr Thr Gly Ala  
 115 120 125

Leu Ala Val Ala Val Ala Gln Pro Thr Asp Val Val Lys Val Arg Phe  
 130 135 140

Gln Ala Gln Ala Arg Ala Gly Gly Gly Arg Arg Tyr Gln Ser Thr Val  
 145 150 155 160

Asn Ala Tyr Lys Thr Ile Ala Arg Glu Glu Gly Phe Arg Gly Leu Trp  
 165 170 175

Lys Gly Thr Ser Pro Asn Val Ala Arg Asn Ala Ile Val Asn Cys Ala  
 180 185 190

Glu Leu Val Thr Tyr Asp Leu Ile Lys Asp Ala Leu Leu Lys Ala Asn  
 195 200 205

Leu Met Thr Asp Asp Leu Pro Cys His Phe Thr Ser Ala Phe Gly Ala  
 210 215 220

Gly Phe Cys Thr Thr Val Ile Ala Ser Pro Val Asp Val Val Lys Thr  
 225 230 235 240

Arg His Met Asn Ser Ala Leu Gly Gln Tyr Ser Ser Ala Gly His Cys  
245 250 255

Ala Leu Thr Met Leu Gln Lys Glu Gly Pro Arg Ala Phe Tyr Lys Gly  
260 265 270

Phe Met Pro Ser Phe Leu Arg Leu Gly Ser Trp Asn Val Val Met Phe  
275 280 285

Val Thr Tyr Glu Gln Leu Lys Arg Ala Leu Met Ala Ala Cys Thr Ser  
290 295 300

Arg Glu Ala Pro Phe  
305

<210> 9  
<211> 312  
<212> PRT  
<213> Homo sapiens

<400> 9  
Met Val Gly Leu Lys Pro Ser Asp Val Pro Pro Thr Met Ala Val Lys  
1 5 10 15

Phe Leu Gly Ala Gly Thr Ala Ala Cys Phe Ala Asp Leu Val Thr Phe  
20 25 30

Pro Leu Asp Thr Ala Lys Val Arg Leu Gln Ile Gln Gly Glu Asn Gln  
35 40 45

Ala Val Gln Thr Ala Arg Leu Val Gln Tyr Arg Gly Val Leu Gly Thr  
50 55 60

Ile Leu Thr Met Val Arg Thr Glu Gly Pro Cys Ser Pro Tyr Asn Gly  
65 70 75 80

Leu Val Ala Gly Leu Gln Arg Gln Met Ser Phe Ala Ser Ile Arg Ile  
85 90 95

Gly Leu Tyr Asp Ser Val Lys Gln Val Tyr Thr Pro Lys Gly Ala Asp  
100 105 110

Asn Ser Ser Leu Thr Thr Arg Ile Leu Ala Gly Cys Thr Thr Gly Ala  
115 120 125

Met Ala Val Thr Cys Ala Gln Pro Thr Asp Val Val Lys Val Arg Phe  
130 135 140

Gln Ala Ser Ile His Leu Gly Pro Ser Arg Ser Asp Arg Lys Tyr Ser  
145 150 155 160

Gly Thr Met Asp Ala Tyr Arg Thr Ile Ala Arg Glu Glu Gly Val Arg  
165 170 175

Gly Leu Trp Lys Gly Thr Leu Pro Asn Ile Met Arg Asn Ala Ile Val  
180 185 190

Asn Cys Ala Glu Val Val Thr Tyr Asp Ile Leu Lys Glu Lys Leu Leu  
 195 200 205

Asp Tyr His Leu Leu Thr Asp Asn Phe Pro Cys His Phe Val Ser Ala  
 210 215 220

Phe Gly Ala Gly Phe Cys Ala Thr Val Val Ala Ser Pro Val Asp Val  
 225 230 235 240

Val Lys Thr Arg His Met Asn Ser Pro Pro Gly Gln Tyr Phe Ser Pro  
 245 250 255

Leu Asp Cys Met Ile Lys Met Val Ala Gln Glu Gly Pro Thr Ala Phe  
 260 265 270

Tyr Lys Gly Phe Thr Pro Ser Phe Leu Arg Leu Gly Ser Trp Asn Val  
 275 280 285

Val Met Phe Val Thr Tyr Glu Gln Leu Lys Arg Ala Leu Met Lys Val  
 290 295 300

Gln Met Leu Arg Glu Ser Pro Phe  
 305 310

<210> 10  
 <211> 24  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: DNA Primer

<400> 10  
 tttttttttt tttttttttt tttt 24

<210> 11  
 <211> 18  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Conserved UCP Peptide Fragment

<400> 11  
 Cys Cys Ile Tyr Thr Ile Gly Ala Tyr Ala Cys Ile Gly Cys Ile Ala  
 1 5 10 15

Ala Arg

<210> 12  
 <211> 19  
 <212> PRT  
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Conserved UCP Peptide Fragment

<400> 12

Ala	Cys	Trp	Thr	Thr	Cys	Cys	Ala	Ile	Ser	Tyr	Ile	Cys	Cys	Ile	Ala
1				5					10					15	

Trp Ile Cys